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STAFF REPORT AND RECOMMENDATION ON CONSISTENCY CERTIFICATION

Applicant: **U.S. Environmental Protection Agency, Region IX**

Consistency Certification No.: **CC-126-00**

Location: Southern California federal waters.

Project Description: Issue general National Pollutant Discharge Elimination System ("NPDES") permit CAG280000 for discharges from 22 offshore oil and gas exploration, development and production facilities located in federal waters off the coast of southern California. Discharges include: drilling muds and cuttings; produced water; well treatment, completion and workover fluids; deck drainage; sanitary wastes and domestic wastes; non-contact cooling water; and fire control test water.

Substantive File Documents: Appendix A

Synopsis

The U.S. Environmental Protection Agency, Region IX ("EPA") proposes to issue a general National Pollutant Discharge Elimination System ("NPDES") permit (No. CAG280000) for oil and gas waste discharges from 22 oil and gas platforms located in federal waters off the coast of southern California.[1] The primary discharges of concern are produced water, drilling fluids and drill cuttings. Currently 13 of the 22 platforms discharge produced water under a 1983 general NPDES permit, or under individual NPDES permits. The project area is outlined in Exhibit A.

The proposed new general NPDES permit will replace all prior general and individual NPDES permits for the 22 platforms and include more stringent effluent limitations than existing permits. All platform dischargers will be subject to the more stringent 1993 EPA effluent limitations; currently only five of the 22 platforms are subject to these more stringent guidelines. Therefore, the new NPDES permit offers the prospect for improved water quality and greater protection of marine resources.

On July 24, 2000, the EPA submitted to the Coastal Commission a consistency certification for the proposed general NPDES permit certifying that the proposed discharge activities are consistent with the enforceable policies of California's Coastal Management Program ("CCMP"). This filing was modified by a subsequent package received December 21, 2000 (Exhibit B: Cover Letter).

NPDES Permit Improvements

The new proposed general NPDES permit offers the following improvements over current discharges:

- Sets current and more stringent limits for allowable produced water discharges;
- Sets volumetric limits for drilling discharges at each platform;
- Requires end-of-well toxicity tests for drilling discharges;
- Addresses National Marine Fisheries Service ("NMFS") concerns relating to effects of discharge on Essential Fish Habitat ("EFH") by adopting most NMFS recommendations for chronic toxicity and effluent plume evaluation;
- Requires all 22 platforms to meet the 1993 effluent limitations for oil and grease;
- Requires monitoring of produced water for chronic whole effluent toxicity ("WET") testing on red abalone; and
- Requires assessment of availability and practicality of using on-line oil and grease monitoring devices for produced water discharges permitted under this permit.

[1] Discharges from platforms Ellen and Elly, two separate platforms connected by a bridge, are authorized under one individual NPDES permit. Hence, previous Commission reports refer to 23 platforms, as opposed to 22.

Compliance Monitoring

Once of the more challenging issues in developing the new NPDES permit has been the resolution of how to monitor compliance with discharge standards most effectively. The EPA's proposed draft general permit, released for public comment in July 2000, relies upon self-monitoring and occasional unannounced spot checks by agency personnel.

The Commission staff communicated to the EPA its concern that the draft general NPDES permit does not contain produced water-monitoring requirements adequate to find the permit consistent with the CCMP. The Commission staff requested that, to reduce the potential for NPDES violations and adverse coastal zone impacts, the EPA provide additional discharge monitoring commitments either as permit requirements or through inter-agency agreements .

In response to Commission staff concerns, the EPA submitted, as part of its consistency certification, a letter that commits the EPA, the Minerals Management Service ("MMS") and industry to the following:

- The EPA and MMS will continue to implement the November 1989 Memorandum of Understanding [Exhibit C ("MOA")] that provides for the EPA and the MMS to develop an annual compliance monitoring workplan that contains specific inspection and sampling protocol for each year of the term of the permit.

- For the duration of the NPDES permit each annual workplan will provide for semi-annual (about six months apart) sampling of produced water from each of the 13 discharging platforms. Sampling inspections will be unannounced and random (*i.e.*, the timing and location of each platform inspection will not be specified in the annual workplan). The MMS will collect the produced water samples during its routine inspections. The EPA will conduct toxicity testing (*i.e.*, bioassays) of the samples using red abalone.

- In addition, each year, produced water samples from six of the 13 platforms will be chemically analyzed for pollutants for which specific limits are set in the permit. Sampling inspections will be unannounced and random. The EPA and the MMS will conduct the sampling. In the event that the EPA is unable to participate in the sampling during the year, the Central Coast Regional Water Quality Control Board will substitute for the EPA to conduct the sampling.

- In the event the EPA is unable to fund the chemical tests during the year, the dischargers will fund the lab costs. In this event, the MMS will select an independent lab to analyze the sample. The lab will work directly for the EPA, <u>not</u> the discharger.

The proposed monitoring program has three key advantages over the current status of compliance monitoring. First, the proposed program is substantially expanded relative to the former program both in respect to toxicity evaluation and to the sheer number of visits. Second, the proposed program provides a guaranteed and verifiable level of unannounced compliance verification visits. Last, the Coastal Commission will receive compliance reports, thereby constructing an administrative trigger for the Commission to verify the good standing of the compliance-monitoring program.

The Commission staff therefore believes that the proposed monitoring program will help ensure that discharge standards are met, thereby preventing violations of the Clean Water Act. Agency oversight will contribute substantially to improved water quality in and around the platforms and ensure greater protection of coastal resources than currently exists.

Potential Resource Impacts and Consistency with CCMP

Notwithstanding the proposed permit's improvements, the discharge of oil and gas wastes into marine waters has the potential to cause significant adverse impacts to marine resources and water quality. Under the new permit, platform operators would continue to discharge muds and cuttings, produced water and other wastes to ocean waters. Biologists and technical experts differ on the degree to which wastes from oil and gas development activities affect the marine environment. The Commission has previously found that these discharges could affect land or waters uses or natural resources of the coastal zone because, as discussed in these findings, the discharges: (1) may reduce the long-term productivity of certain marine species to a level below that necessary to sustain healthy populations; (2) reduce available fishing area and potentially contaminate or cause changes in fish species that dwell near platforms; and (3) cause cumulatively significant adverse impacts, such as chronic sublethal effects.

Therefore, staff believes that the discharges that will occur under the general NPDES permit are inconsistent with the enforceable policies of Chapter 3 of the Coastal Act related to marine resources, water quality, fisheries and cumulative effects.

Nonetheless, since oil and gas OCS platforms are "coastal-dependent industrial facilities" as defined in Coastal Act §30101, the proposed general NPDES permit can be considered under the "override" provisions of Coastal Act §30260, which provides for special consideration of coastal-dependent industrial facilities that may otherwise be inconsistent with the Coastal Act's Chapter 3 policies.

The "override" provisions of Coastal Act §30260 allow for permitting of projects that are otherwise inconsistent with other sections of Chapter 3 policies when:

> *(1) alternative locations are infeasible or more environmentally damaging; (2) to do otherwise would adversely affect the public welfare; and (3) adverse environmental effects are mitigated to the maximum extent feasible.*

The Commission staff believes that the three tests of §30260 have been met. First, staff believes that alternatives for discharging wastes to the marine environment are either infeasible at this time or are more environmentally damaging than on-site discharging. Further, although the discharges adversely affect the marine environment, the proposed permit's dual benefit of providing continuing energy benefits from existing oil and gas development and production facilities, as well as the assurance of vastly improved water quality standards at existing federal platforms through more stringent effluent limitations present a clear benefit to the public welfare and trust resources. An objection to the EPA's consistency certification would adversely affect the public welfare by delaying much-needed improvements to discharge limits at federal platforms.

Finally, the staff believes that the EPA has incorporated into the proposed general NPDES permit mitigating measures (*e.g.*, more stringent effluent limitations and new and improved compliance measures), such that the adverse effects of the proposed discharges will be mitigated to the maximum extent feasible.

Staff Recommendation

Therefore, the Commission staff believes that the activities that the EPA proposes to authorize through issuance of general NPDES permit No. CAG280000 as described in its consistency certification are consistent with the enforceable policies of the CCMP. Accordingly, staff recommends that the Commission *concur* in the EPA's consistency certification.

1.0 STAFF RECOMMENDATION

Motion*:*

I move that the Commission concur with consistency certification CC-126-00 that the activities described therein are consistent with the enforceable policies of the California Coastal Management Program ("CCMP").

Staff recommends a **YES** vote on the motion. Passage of this motion will result in concurrence in the EPA's consistency certification and adoption of the following resolution and findings. An affirmative vote of a majority of the Commissioners present is required to pass the motion.

Resolution:

The Commission hereby concurs in the consistency certification by the Environmental Protection Agency on the grounds that the proposed project described therein is consistent with the enforceable policies of the CCMP.

2.0 FINDINGS AND DECLARATIONS

2.1 Project Description

The United States Environmental Protection Agency, Region IX ("EPA") proposes to issue a general National Pollutant Discharge Elimination System ("NPDES") permit for oil and gas waste discharges from 22 Outer Continental Shelf ("OCS") oil and gas platforms located in federal waters off the coast of Southern California (from an area west of Point Arguello to an area southeast of Santa Barbara).[2] Most platforms are located within the Santa Barbara Channel.[3] The term of the proposed general permit is five years.

The proposed general permit would apply to the existing 22 development and production platforms, and new exploratory drilling operations located in and discharging to 83 specified lease blocks in federal waters on the Pacific OCS. New source production platforms would not be covered by the proposed permit and would require individual NPDES permits. Also, the EPA may require any discharger authorized by the general permit to apply for and/or obtain an individual NPDES permit if the terms of the general permit are determined to be inappropriate for a particular facility.

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[2] 40 CFR §122.28 "The Regional Administrator shall, except as provided below, issue general permits covering discharges from offshore oil and gas exploration and production facilities within the Region's jurisdiction…"

[3] Existing platforms that are to be covered by the proposed general NPDES permit are: Platforms A, B, C, Edith, Ellen/Elly, Eureka, Gail, Gilda, Gina, Grace, Habitat, Harmony, Harvest, Henry, Heritage, Hermosa, Hillhouse, Hidalgo, Hogan, Hondo, Houchin, and Irene.

2.1.1 *Summary of the Proposed General Permit*

Types of Discharges Authorized. The proposed general permit would authorize the following discharges (subject to the terms and conditions of the permit) in all areas of coverage: drilling fluids and drill cuttings; produced water; well treatment, completion and workover fluids; deck drainage; domestic and sanitary waste; blowout preventer fluid; desalination unit discharge; fire control system test water; non-contact cooling water; ballast and storage displacement water; bilge water; boiler blowdown; test fluids; diatomaceous earth filter media; bulk transfer material overflow; uncontaminated freshwater; water flooding discharges; laboratory wastes; excess cement slurry; hydrotest water; and hydrogen sulfide gas processing waste water.

Effluent Limitations. The proposed general permit includes effluent limitations based on (a) Best Conventional Pollutant Control Technology ("BCT") for the control of conventional pollutants; (b) Best Available Treatment Economically Achievable ("BAT") for the control of toxic and non-conventional pollutants, and; (c) additional effluent limitations based on section 403(c) (ocean discharge requirements) of the Clean Water Act (CWA; 33 USC § 1343(c)). The EPA promulgated BAT and BCT effluent limitation guidelines on March 4, 1993.[4] These BAT/BCT effluent limitations have been included in the proposed permit, along with certain additional effluent limitations based on section 403(c) of the CWA. In addition, discharge-monitoring requirements have been included to ensure compliance with the effluent limitations.

The EPA currently lacks sufficient information to establish appropriate final effluent limitations for certain pollutants (primarily heavy metals and toxic organics) in produced water discharges. For these pollutants, the proposed permit would require each discharger to monitor these pollutants so that the EPA may evaluate whether the discharges have a reasonable potential to cause or contribute to exceedances of marine water quality criteria.[5] Based on the results of the monitoring (which would be available approximately 2-1/2 years into the term of the permit), the EPA may, at their discretion, and based upon the monitoring results, reopen the permit to include additional effluent limitations.

In view of the variety of pollutants in produced water, the proposed permit also requires chronic whole effluent toxicity ("WET") monitoring to measure the aggregate toxic effects of the pollutants. If toxicity is detected, accelerated testing would be required by the permit, and if the toxicity persists, a Toxicity Reduction Evaluation ("TRE") would be required along with a Toxicity Identification Evaluation ("TIE") to identify the specific chemical(s) causing the toxicity.

Ocean Discharge Criteria Evaluation ("ODCE"). Section 403 of the CWA, as implemented by 40 CFR §§ 125.120-124, requires that an NPDES permit for a discharge into marine waters located

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[4] *Effluent Limitations Guidelines for the Oil and Gas Extraction Point Source Category, Offshore Subcategory* [*58 Federal Register 12454, March 4, 1993*].

[5] 40 CFR 122.44 (d)(1)

seaward of the inner boundary of the territorial seas be issued in accordance with guidelines for determining the potential degradation of the marine environment.

The EPA prepared an ODCE entitled ``Ocean Discharge Criteria Evaluation South and Central California for NPDES Permit No. CAG280000" dated January 2000, which evaluates the discharges which would be authorized by the proposed general permit. After review of the ODCE, other available data and studies in the administrative record for the permit, and comments received on the proposed permit, the EPA has concluded that the proposed discharges would not cause unreasonable degradation of the marine environment.

The proposed NPDES permit offers substantial and comprehensive improvements over present discharge requirements for the 22 platforms because it incorporates the more stringent 1993 effluent discharge standards. Most notably, these 1993 guidelines[6] reduce allowable discharges of oil and grease[7] to 42 mg/l daily maximum and 29 mg/l monthly average. Furthermore, the technology used to reduce oil and grease to these new levels captures and reduces discharges of other pollutants as well. The relative stringency of the new standards is outlined in Exhibit D. The proposed NPDES permit will also, for the first time, place a volumetric limit on the discharge of drilling muds and cuttings to the marine environment. Previously, only the toxic components of the muds were subject to discharge requirements.

Of the 22 platforms, 14 operate under standards set by a general NPDES permit issued in 1982, four operate under individual permits issued between 1992-1994, two have elected to reinject discharges, thereby bypassing the need for either NPDES permits or consistency certifications, and two operate under individual permits issued in 1977. All individual and general permits covering the 22 production platforms in the southern California OCS are expired. Pursuant to 40 CFR § 122.6, on an annual basis the EPA administratively and automatically renews expired permits without alteration.

Of the 22 platforms, all produce drilling muds and cuttings, but only 13 discharge produced water.[8] The remaining nine platforms either contribute to the discharge of the 13 via combined discharge, or re-inject produced waters onshore or offshore.

Self-Monitoring Requirements

Under the proposed NPDES permit, the expanded, self-monitoring will entail the following:

- Quarterly chronic toxicity testing with red abalone;

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[6] 40 CFR Ch. 1, Part 435 and *Effluent Limitations Guidelines for the Oil and Gas Extraction Point Source Category, Offshore Subcategory* [*58 Federal Register 12454, March 4, 1993*].

[7] "Oil and grease" is both a conventional pollutant subject to "best conventional pollution control technology" ("BCT") and an indicator of toxic pollutants, subject to "best available pollution control technology economically achievable" ("BAT").

[8] Platforms A, B, Edith, Gail, Gilda, Gina, Habitat, Harmony, Harvest, Hermosa, Hidalgo, Hillhouse, Hogan.

- Annual toxicity screening adjusted for seasonal variations with the following representative species to collect data for the next permit cycle: Giant kelp (plant), Topsmelt (vertebrate), and red abalone (invertebrate);

- Toxicity testing accelerated to one test every three weeks for eighteen weeks should regular toxicity testing detect triggering levels of toxicity;

- Daily monitoring of effluent;

- Notification of non-compliance within 24 hours;

- Rectification or submission of rectification plan for non-compliance within five days;

- "Reasonable Potential" Pollutant Analysis: Data sets will be collected for ten quarters to determine if, in addition to proposed effluent limits, effluent limits should be set for currently unlimited constituents.

All of these data sets will be reported to the EPA for assessment, and as such will be available to the general public for oversight. The reports will also be provided to the Coastal Commission in order to track compliance monitoring. The EPA will then determine compliance with established effluent limits, and possibly establish effluent limits for listed, but not limited constituents as part of the "Reasonable Potential" analysis.[9]

Agency Monitoring Commitments

In response to Commission staff concerns, the EPA amended its consistency certification to add the following monitoring commitments during the five-year term of the permit:

- The EPA and MMS will continue to implement the November 1989 Memorandum of Understanding ("MOA") that provides for the EPA and the MMS to develop annual compliance monitoring work-plans containing inspections and sampling protocol for each year of the term of the permit. Exhibits E and F outline the proposed workplan.

- Every year, each of the 13 discharging platforms will be sampled twice. Sampling inspections will be unannounced and random (*i.e.*, the timing and location of each platform inspection will not be named in the annual work-plan). The MMS will collect a produced water sample during its routine inspections. The EPA will conduct chronic whole effluent toxicity ("WET") testing at their own labs using red abalone. WET testing is particularly useful since it measures the combined effect of all the pollutants in a discharge.

[9] The "Reasonable Potential Analysis" refers to the evaluation of a discharge with a reasonable potential of degrading the marine environment. Under this framework, certain constituents are listed, but discharge limits are not set until the analysis is conducted. The results of the analysis will dictate whether or not new effluent limits should be set.

- In addition, each year, six of the platforms will be sampled and the samples will be chemically analyzed for pollutants for which specific limits are set in the permit. Sampling inspections will be unannounced and random. The EPA and the MMS will conduct the sampling. If funding constraints preclude the EPA from taking samples during the year, the Central Coast Regional Water Quality Control Board will substitute for the EPA to conduct the sampling. (See Exhibit G, attached letter from the Regional Water Quality Control Board to Terry Oda, EPA).

- In the event the EPA is unable to fund the chemical tests during the year, the dischargers will fund the lab costs. In this event, the MMS will select an independent lab to analyze the sample. The lab will work directly for the EPA, not the discharger. (See Exhibit H, attached letter from the Western States Petroleum Association -- WSPA – to Terry Oda, EPA).

- The MMS will conduct visual and records inspections at least once per year at each platform.

2.2 Background

Discharges into navigable waters of the United States are regulated under the federal Clean Water Act ("CWA"). CWA §402 and 301(a) authorize the EPA to administer the NPDES permit program prohibiting discharges of pollutants to surface waters except in compliance with the terms and conditions of an NPDES permit.[10]

2.2.1 *Coastal Commission Review of Past NPDES Permits*

For nearly two decades, the Commission has collaborated with the EPA, the MMS, the County of Santa Barbara, the State Water Resources Control Board ("SWRCB"), and others to establish discharge standards at oil and gas production platforms in State and federal waters. In some instances, these efforts have occurred in the context of general NPDES permits. More recently, in federal waters, these efforts have resulted in individual permits issued to four platforms. Now, the Commission is conducting a consistency evaluation of the EPA's proposed general NPDES permit for 22 offshore oil and gas producing platforms, of which 13 discharge produced water.

The origin of the current effort dates back to EPA efforts in the mid-1980s to issue a general NPDES permit for platforms in federal waters. In February 1982 the EPA issued a general NPDES permit set to expire in January, 1984. In January, 1984, the Coastal Commission concurred in a consistency certification to extend the 1982 general permit's expiration date for an additional six months, through June, 1984 (CC-26-83).

When the EPA sought to issue new general NPDES permits in February, 1986, the Coastal Commission objected to consistency certifications for NPDES permits nos. CAG280622 (development/production operations) and CAG280605 (exploratory operations) (CC-38-85/CC-39-85). The Commission based its objection on findings that the permits:

- provided insufficient protection of site-specific, sensitive marine resources;

[10] CFR §122.49(d)

- did not comply with all state water quality standards or fully explain reasons for excluding feasible standards;
- provided inadequate monitoring procedures to control discharges and ineffective testing methods to detect levels of discharge toxicity;
- provided inadequate enforcement measures to ensure permit compliance; and
- did not mitigate potential adverse impacts to coastal zone resources to the maximum extent feasible.

The 1986 general permits were thus never issued, and the EPA did not propose a revised or new version of a general permit until now. Consequently, the existing individual permits and the 1982 general permit were never superceded,[11] and new sources were handled via new individual permits.

Since 1986, the Commission has concurred with consistency certifications for individual NPDES permits for the following five platforms:

- Exxon Platforms Harmony and Heritage *(CC-68-92, 8/12/92, for "Phase I" discharges; and CC-85-92, 4/14/93, for "Phase II" discharges)*;[12]
- Chevron Platform Gail *(CC-68-93, 2/17/94)*;
- Chevron Platform Grace *(CC-65-94, 11/15/94)*; and
- Torch Platform Irene *(CC-45-94, 11/15/94)*.

These individual NPDES permits include the new, more stringent discharge standards promulgated in the EPA's 1993 *Effluent Limitations Guidelines*.

Finally, the Commission has not concurred in the EPA's 1993 renewal of the individual permit for Platforms Ellen and Elly[13] because neither the operator nor the EPA to date has submitted to the Commission a consistency certification. Hence, the NPDES permit renewal is not effective. The operator has not been discharging since April 1991, however, choosing instead to re-inject produced water.

The Commission's federal consistency NPDES actions are summarized in Exhibit I.

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[11] Although these existing permits have expired, pursuant to *40 CFR § 122.6* and *5 USC § 558(c)*, the EPA has on an annual basis administratively extended each such expired permit.

[12] Discharges from Platforms Harmony and Heritage are permitted under two individual NPDES permits. The Coastal Commission conducted its consistency review, however, for both platforms together, but considered the discharges from both platforms in two phases.

[13] Discharges from Platforms Ellen (drilling platform) and Elly (processing platform), two separate platforms connected by a bridge, are authorized by one individual NPDES permit.

2.2.2 *California Coastal Commission Consistency Review Authority*

NPDES permits issued by the EPA under CWA §402 are subject to the consistency provisions of the federal Coastal Zone Management Act ("CZMA") which state:

> *[A]ny applicant for a required federal license or permit to conduct an activity, in or outside the coastal zone, affecting any land or water use or natural resource of the coastal zone of that state shall provide…a certification that the proposed activity complies with the enforceable polices of the state's approved program and that such activity will be conducted in a manner consistent with the program. (CZMA § 307(c)(3)(A))*

Since there are no applicants for general NPDES permits, the EPA in effect becomes the applicant, and must provide the consistency certification.

The Coastal Commission first exercised its federal consistency review authority under the CZMA on August 31, 1978. Chapter 11 of the California Coastal Management Program ("CCMP") lists NPDES permits issued by the EPA as an activity requiring a consistency concurrence from the Commission [see also *14 CCR § 13660.1(a)*].

On July 24, 2000, the EPA submitted to the Coastal Commission a consistency certification for the proposed general permit. The proposed new general NPDES permit will become effective if and when the Coastal Commission concurs with the EPA's consistency certification. The concurrence, if granted, will be a "general" concurrence as that term is defined and used in Section 930.53(c) of the Coastal Zone Management Act ("CZMA") regulations [*15 CFR § 930.53*].

To concur with NPDES consistency certifications, the Commission must find the proposed activities consistent with the enforceable policies of the CCMP. Those policies consist of the following:

- The Chapter 3 policies (sections 30200 – 30265.5) of the California Coastal Act ("CCA") *(California Public Resources Code ("PRC"), Division 20)*, incorporated into and made a part of the CCMP by CCA section 30008;
- The enforceable policies of the State Water Resources Control Board's "California Ocean Plan" (also known as the "Water Quality Control Plan for Ocean Waters of California" or "Ocean Plan"), incorporated into and made a part of the CCMP by section 307(f) of the CZMA (16 USC § 1456(f)); and
- Section 13142.5 of the California Water Code, which provides additional water quality policies relating to the coastal marine environment,[14] incorporated into the CCMP by CCA Section 30412(a)).

[14] Specifically, Section 13142.5 addresses, among other things, treatment of wastewater discharges to protect and restore beneficial uses of receiving waters, and conducting baseline studies of the marine system.

3.0 California's Coastal Management Program ("CZMA") Issues

To issue a concurrence with the EPA's consistency certification, the Commission must find that the proposed activities authorized under the renewed general NPDES permit are consistent with the enforceable policies of the CCMP, which are identified in the previous section of this staff report. Chapter 3 Coastal Act policies pertinent to discharges include fill in coastal waters (§30233), marine resources and water quality (§30230, §30231) and cumulative impacts (§30250).

3.1 Fill of Coastal Waters

Coastal Act §30108.2 defines "fill" as "earth or any other substance or material, including pilings placed for purposes of erecting structures thereon, placed in a submerged area." Under the proposed permit, OCS platform operators will continue to discharge muds and cuttings to ocean waters as a routine part of drilling operations. In addition, mussels and other species will continue to be scraped from platforms periodically creating shellmound layers of invertebrate shells and drilling muds and cuttings.[15] These shellmounds of drill muds and cuttings constitute "fill" as that term is defined in Coastal Act §30108.2.
Coastal Act §30233(a) states in part:

> *The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following:*
>
> *(1) New or expanded port, energy, and coastal-dependent industrial facilities, including commercial fishing facilities.*
>
> *(2) Maintaining existing, or restoring previously dredged depths on existing navigational channels, turning basins, vessel berthing and mooring areas, and boat launching ramps.*
>
> *(3) In wetland areas only, entrance channels for new or expanded boating facilities; and in a degraded wetland, identified by the Department of Fish and Game pursuant to subdivision (b) of Section 30411, for boating facilities if, in conjunction with such boating facilities, a substantial portion of the degraded wetland is restored and maintained as a biologically productive wetland. The size of the wetland area used for boating facilities, including berthing space, turning basins, necessary navigation channels, and any necessary support service facilities, shall not exceed 25 percent of the degraded wetland.*

[15] The proposed permit allows for the total annual discharge from existing platforms of 2,189,000 barrels (bbl) of drilling fluids, 666,150 bbl of cuttings, and 62,500 bbl of excess cement.

(4) In open coastal waters, other than wetlands, including streams, estuaries, and lakes, new or expanded boating facilities and the placement of structural pilings for public recreational piers that provide public access and recreational opportunities.

(5) Incidental public service purposes, including but not limited to, burying cables and pipes or inspection of piers and maintenance of existing intake and outfall lines.

(6) Mineral extraction, including sand for restoring beaches, except in environmentally sensitive areas.

(7) Restoration purposes.

(8) Nature study, aquaculture, or similar resource dependent activities.

Coastal Act §30233(a) restricts the Coastal Commission from authorizing a project that includes open coastal water fill unless it meets three tests. The first test requires the proposed activity to fit into one of eight categories of uses enumerated in Coastal Act §30233(a)(1)-(8). The second test requires that there be no feasible less environmentally damaging alternative. The third and last test mandates that feasible mitigation measures be provided to minimize the project's adverse environmental effects.

3.1.1 *Allowable Use Test*

The proposed NPDES permit extends to the operators of OCS oil and gas platform authority to discharge oil and gas exploration, development and production wastes. As such, the discharge activity will take place from an energy facility and therefore is an allowable use under Coastal Act §30233(a)(1).

3.1.2 *Feasible Less Environmentally Damaging Alternative*

The Commission must further find that there is no feasible less environmentally damaging alternative to the proposed discharge into ocean waters of drill muds and cuttings. In its consideration of the proposed reissuance of the general NPDES permit, the EPA evaluated two potential alternatives: (a) barging muds and cuttings to shore, and (b) the reinjection of muds and cuttings.

Barging

In promulgating its *1993 Effluent Guidelines,* the EPA considered barging and onshore disposal of all muds and cuttings as a substitute for ocean discharge. However, the EPA did not adopt requirements to barge uncontaminated (non-oiled) muds and cuttings from platforms located more than 3 nautical miles ("nm") from shore due to (1) the adverse impacts associated with the long distances (offshore and onshore) required for transport, and (2) the lack of permitted land disposal facilities suitable for disposal. The EPA currently requires barging-to-shore of all contaminated muds and cuttings.

The Commission has also reviewed information on barging from OCS waters and found that while barging may be feasible for a project, it entails significant tradeoffs with other adverse environmental effects such as increased nitrogen oxide ("NOx") emissions, increased risk of spills during transit, and a lack of land disposal sites with the capacity to store the volumes of muds and cuttings generated at both state and OCS platforms. *(CC-47-87 February 1987; information from State Lands Commission (SLC), State Water Resources Control Board (SWRCB),Regional Water Quality Control Board (RWQCBs), State Waste Management Board, Minerals Management Service (MMS), Santa Barbara County and Texaco.)*

Based on the most current information, the Commission believes that the environmental tradeoffs associated with barging non-oiled muds and cuttings from the 22 platforms located on the OCS is more environmentally damaging than the impacts of onsite discharging. For instance, barges required for this alternative would emit vast quantities of NOx and sulfuric oxide ("Sox") in the course of their operation. Land disposal sites are limited, and do not provide an environmentally preferable solution to the disposal question.

However, further and more current quantification of the environmental trade-offs associated with alternative disposal locations is wanting. Therefore, the EPA is requiring from applicants an updated evaluation of drilling mud disposal alternatives one year prior to the expiration of the permit. The EPA may include in the subsequently issued permit additional effluent limitations or other conditions based on the results of the evaluation. The Commission will reconsider disposal alternatives in light of the new report, technological improvements, and other factors at any future consistency review of the NPDES permit.

Re-injection

Re-injection of drill muds and cuttings is a potential alternative to on-site discharging, although it is not widely practiced. One past study *(Continental Shelf Associates,* 1985) of alternate disposal methods concluded that re-injection of muds and cuttings is not a practical alternative for southern California offshore operations, as the substances would plug the geologic formations and reduce the amount of hydrocarbons that could be retrieved.

On the other hand, past experience suggests that re-injection into non-producing wells is possible when geological formations are conducive. At Platform Heritage, for example, Exxon conducts an operation whereby drilling cuttings are ground to a sufficiently small size, pushed down the annulus of the well, and thereby disposed of. Given the aforementioned preconditions for re-injection, feasibility must be conducted on a case-by-case basis.

In order to conduct site-by-site feasibility studies, the proposed NPDES permit requires operators to conduct a feasibility study of "Drilling Waste Disposal Alternatives", including the recycling and reuse of muds and cuttings, and the reinjection of either as an alternative to direct discharge.

Given information available at this time, the Commission finds that reinjecting muds and cuttings is not currently feasible. However, the Commission anxiously awaits the EPA required report cited above in order to conduct a more thorough analysis of this issue. Partial or complete

reinjection at these platforms might very well become a condition for consistency of renewed NPDES permits.

The Commission thus finds that the proposed direct discharge of muds and cuttings is the least environmentally damaging alternative.

3.1.3 *Mitigation Measures*

Finally, the filling of open coastal waters may be permitted if feasible mitigation measures have been provided to minimize any adverse environmental effects. The EPA has included in the proposed permit the following conditions:

- The proposed permit sets, for the first time, limits on the discharge of drilling muds and cuttings, and excess cement;
- The permit effectively prohibits the use of non-aqueous based drilling fluids. Thus, future depositions of drilling muds and cuttings will not be characterized by layers of oil and gas constituents such as hydrocarbons; and
- Dischargers must provide a report to the EPA assessing the feasibility of disposal methods for drilling fluids and cuttings other than direct discharge (such as onshore disposal, increased recycling and reuse, ocean dumping off-site, and reinjection). The report shall also assess the emission levels of vessels used to transport drilling fluids, a key aspect of disposal alternatives evaluation.

With these measures in place, the Commission finds that the third and final test of Coastal Act §30233(a) has been met for two reasons: (1) The environmental effects of offsite disposal as presently understood appear to outweigh the environmental effects of onsite disposal, and (2) The potential for reinjection of drilling muds and cuttings appears remote. Therefore, despite the potential for significant effects, the proposed NPDES permit provides the maximum feasible level of mitigation. The Commission therefore finds the proposed NPDES permit consistent with Coastal Act §30233(a).

3.2 Marine Resources and Water Quality

Coastal Act §30230 states:

> *Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.*

Coastal Act §30231 states in part:

> *The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms*

> *and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges….*

Coastal Act §30250 requires in part that new industrial development:

> *be located within, contiguous with, or in close proximity to, existing developed areas able to accommodate it or, where such areas are not able to accommodate it… where it will not have significant adverse effects, either individually or cumulatively, on coastal resources.*

The discharge of oil and gas wastes into marine waters has the potential to cause significant adverse impacts to marine resources and water quality. Under the new proposed permit, platform operators would continue to discharge muds and cuttings, produced water and other wastes to ocean waters. Clearly, the effluent discharge standards and terms of the proposed permit are an improvement as compared to the existing standards under which the platform operators currently discharge. The proposed permit's more stringent effluent limitations offer the prospect for improved water quality and greater protection of marine resources. Nevertheless, the Commission continues to be concerned that the scientific research on the effects of oil and gas wastes on marine resources and water quality is inconclusive, and that the mass of, and toxic concentrations in, projected discharges, both individually and cumulatively, may still damage the biologic productivity of coastal waters. These concerns are shared by the State Lands Commission, which has maintained since the 1980s a stated policy prohibiting the discharge of drilling muds and cuttings into State waters.
Specific effects of platform discharges can be immediate, chronic, direct, or indirect. Substantial disagreement exists among experts regarding the degree to which drill muds and cuttings, produced water and other oil and gas waste discharges affect the marine environment. In 1983, a National Research Council ("NRC") panel concluded that the effects and environmental risks of individual drilling discharges to most communities in high-energy depositional environments, such as OCS waters, are quite limited in extent and are confined mainly to the benthic environment. (NRC, p. 6) The NRC added that uncertainties still exist concerning the effects on communities in low-energy depositional environments that experience large inputs of drilling discharges over long periods of time. (NRC, p.7.)

The respective levels of significance of these discharges is the subject of some dispute. Under the proposed permit, the platforms are will continue to discharge substantial muds and cuttings, produced water, and other waste streams to ocean waters in the permit area. A more detailed discussion of drilling discharges and produced water discharges follows.

3.2.1 *Produced Water*

Produced water resulting from the separation of water from the oil and gas mixture extracted from wells often contains measurable amounts of hydrocarbons and other organic compounds, dissolved salts, and metals. During oil and gas production, produced water --when not reinjected-- is the most significant production discharge in terms of volume and potential environmental effects. According to the EPA Industrial Technology Division (EPA-ITD), the "most obvious pollutant of concern for produced waters is oil and grease." (56 *Federal Register*

10682.) In addition to oil and grease, produced water contains other priority pollutants such as arsenic, cadmium, lead, benzene, ethylbenzene, naphthalene, toluene, and zinc. Concerns with produced water discharges include changes in fish species composition resulting from impacts to the water column (e.g., turbidity or toxicity from effluent concentrations that exceed regulatory criteria) and chronic toxicity.

Chronic toxicity may include sublethal effects such as reduced reproductive success, diminished appetite, and changes in mating, sheltering, or predation behavior (*e.g.*, many marine organisms ingest wastes, retain the constituents within body tissues, and eliminate the materials very slowly; thus wastes may accumulate until they reach toxic levels, even if the initial concentrations of the wastes are below acute toxic levels.) Halogenated hydrocarbons and heavy metals such as mercury and lead have the greatest potential to bioaccumulate in marine organisms.

The Commission has also previously raised some concern over discharges of deck drainage, which can include detergents, small quantities of oil, surfactants and emulsifiers used to clean surfaces, tanks and equipment. Other effluents (*e.g.*, sanitary and domestic wastes from Coast Guard approved Class I treatment units, fire control test water, desalination unit discharge, and noncontact cooling water) have been compared to common discharges emanating from large oceangoing vessels. (CC-38-851CC-39-85, *February* 1986,- CC-56-86, *March* 1987.) The major difference is that platform discharges occur more or less continuously and at a fixed location.

Other research indicates that specific marine organisms are sensitive to minute concentrations of pollution. Cherr et al. (1993) detected abnormal development in embryos of purple sea urchin *(Strongylocentrotus purpuratus)* exposed to varying concentrations of produced water under controlled laboratory conditions; effects ranged from sensitivity at concentrations of 3% produced water, to delay in development at 3-5% produced water, to physical changes at 7% produced water. Preliminary results suggest that the abnormal effects may be related to the presence of sodium arsenite, a constituent of some types of produced water. (Cherr et al., 1993, pp. 28-30.)[16]

Findings from the Southern California Educational Initiative program have shown that produced water discharges from an oil processing facility in Carpinteria impact reproductive development and growth of mussels (Osenberg and Schmitt, 1991; Osenberg et al., 1992; Fan et al., 1992), early embryonic development in sea urchins (Baldwin et al., 1992; Krause et al., 1992), larval settlement and metamorphosis in abalone (Raimondi and Schmitt, 1992), and development in giant kelp (Cherr et al., 1991; Garman et al., 1991). Cherr et al. (1993) also demonstrated perturbations in the reproduction of the California mussel *(Mytilus californianus)* chronically exposed to a sample of produced water under controlled laboratory conditions.

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[16] Produced water composition can be highly variable among formations, but in all cases appears to be very complex, consisting of non-polar and polar organic compounds, as well as inorganic cations and anions, and combinations of these diverse chemical categories (National Research Council, 1985). The authors note later that produced water composition may vary from batch to batch and that, since the results reported were derived from one batch only, a general conclusion of the impact of all produced waters cannot be drawn. (Cherr, et al., 1993, p. 112.)

3.2.2 *Drill Muds and Cuttings*

Under the proposed permit, platforms will continue to discharge muds and cuttings to ocean waters as a routine part of drilling operations. In addition, invertebrates will continue to be scraped from platforms periodically creating shellmounds at the base of the platforms. The proposed permit allows for the total annual discharge from existing platforms of 2,189,000 barrels (bbl) of drilling fluids, 666,150 bbl of cuttings, and 62,500 bbl of excess cement. This volume will possibly increase, depending on the outcome of applications for exploration now under review by Commission staff.[17]

The proposed permit represents the first effort to limit the discharge volume of drilling muds and cuttings. Previously the general and individual permits only limited certain constituents within the compounds. However, the Commission remains concerned about the direct and cumulative effects of drilling fluids on marine resources. The Commission in its findings objecting to EPA Region 9's prior proposed general NPDES permits expressed concern that scientific research on the effects of drilling fluids on marine resources was inconclusive, and that the mass of, and toxic materials concentrations in, muds and cuttings may damage the biological productivity of coastal waters. (CC-38-85/CC-39-85, February 1986). The EPA has since filed a broad report addressing this and other topics, though the findings on this topic in the report remain inconclusive.[18] The EPA concludes that while localized effects may occur, unreasonable degradation to the marine environment will not result.

Site-specific effects of muds and cuttings discharges include burial of benthos immediately below or adjacent to the platform, bioaccumulation of contaminants found in drilling fluids, and changes in benthic species composition resulting from accumulation of contaminants in sediments. All of the former effects have the potential to impair the food web found in the platform vicinity, thereby detrimentally affecting coastal resources and Essential Fish Habitat. A common practice of drilling operators is to dump large volumes of muds and cuttings when changing drilling formations (*i.e.*, when muds are changed to accommodate varying geologic conditions in the well hole). Drill muds and cuttings are released several times during drilling operations on a single well, with the final mud dump frequently the largest discharge.

When applicable, burial of hard bottom habitat areas is of particular concern due to the limited number of these areas and their importance to regional productivity. Marine organisms in the water column near drilling operations are also subject to large fluctuations or changes in water column chemistry because muds and cuttings discharges occur sporadically. Drill muds and cuttings are released several times during drilling operations on a single exploration or production well.

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[17] For instance, an Environmental Impact Statement is now underway for 5-8 exploration wells in the northern Santa Barbara Channel and Santa Maria Basin.

[18] *Ocean Discharge Criteria Evaluation South and Central California for NPDES Permit No. CAG280000*. Prepared by Science Applications International Corporation, January 3, 2000.

Research conducted by Morse, Zimmerfaust, and others at the University of California, Santa Barbara indicates that the metamorphosis to the juvenile stage of red abalone *(Haliotis rufescens)* larvae is adversely affected in the presence of very low concentrations in the marine environment of the heavy metal constituents of drill muds and additives (*i.e.*, mercury, cadmium, barium, zinc, and lead) as evidenced by disruption of settlement patterns. Studies by Morse (1984) in near-shore environments indicate that the presence of drilling wastes in the water column inhibit the natural chemical signal from the environment associated with crustose red algae that is required to trigger settlement, attachment, and the start of metamorphosis. Morse concludes:

> *These data demonstrate that the proposed development of petroleum from nearshore leases therefore has a high likelihood for strong negative impact on recruitment of abalone.... Similar negative impacts may be predicted to affect recruitment of other benthic non-fish resources, including crabs, shrimp, lobster, clams, oysters, scallops, etc.*

In establishing the 1993 *Effluent Guidelines,* the EPA conducted an extensive, updated review of the available literature that identified and analyzed 23 field impact studies for their findings on the localized environmental impacts of drill fluids and cuttings discharges near oil and gas drill sites and platforms in waters of the Gulf of Mexico, Southern California, and Alaska. (EPA, *"Regulatory Impact Analysis of Final Effluent Limitations Guidelines and Standards for the Offshore Oil and Gas Industry, " January* 1993; hereinafter "RIA ".) The majority of the case studies originated in the Gulf of Mexico with only one study from offshore California: the five-year California OCS Phase H Monitoring Program (CAMP), a multidisciplinary study to monitor potential environmental changes resulting from OCS oil and gas development in the Santa Maria Basin.

The EPA's analysis suggests the following:

1. Discharges of muds and cuttings are capable of producing localized physical, chemical, and biological impacts:

   - Discharged fluids and cuttings contaminate sediments with heavy metals and hydrocarbons. The studies document increases in sediment barium levels of two- to 100-fold at drill sites, with typical increases of 10- to 40-fold. Increases in other trace metals (*e.g.*, arsenic, cadmium, chromium, copper, silver, lead, and zinc) were also observed within 250-500 meters of the drill site and not more than five- to ten-fold above background levels.
   - Biological impacts from single wells occur on a scale from several hundred to several thousand meters, chemical impacts were noted from several to tens of kilometers (kms). Alterations to benthic community structure are virtually always observed within 300 meters of the discharge site. However, changes have been noted in some cases at 500 to 1,000 meters from the site.
   - Other biological effects include declined abundance in benthic species and bioaccumulation of heavy metals. Changes in abundance, richness (number of species), and diversity of fauna were noted. Taxa affected include annelids, mollusks, echinoderms, and crustaceans.

2. Observations on the long-term, regional-scale fate of drilling fluid solids indicate that a fraction of the materials may be widely dispersed. For example, drilling fluid fine solids can be transported over relatively long distances (35-65 kms) to a regional area of deposition, albeit at low conditions, based on a study of eight exploratory wells. In shallow water (13-34 meters, or 43-112 feet) only about 6% of discharged barite was accounted for within a 3-krn radius of three drill sites (in general, shallower offshore waters are more energetic than deeper water).

3. The studies do not document that larger-scale (several hundred to 1,000 meters) impacts occur. However, the studies may not be sufficient to conclude that regional-scale impacts do not occur.

4. Modeling of drilling fluid plume dispersion and field studies of discharge plumes indicate that, in general, plume dispersion is sufficient to minimize water quality impacts and water column toxicity concerns in energetic, open waters of the OCS.

5. The principal impact of muds and cuttings discharges are benthic effects, due to the very high solids content of drilling fluids (10% to 70% solids by weight). Benthic community changes have been hypothesized to be due largely to physical effects. However, no studies have quantitatively discriminated between impacts from physical effects (altered sediment texture) and chemical effects (sediment-associated toxics).

According to the editors, the CAMP study of the potential environmental changes resulting from oil and gas development in the Santa Maria Basin offshore California is "an outstanding example of the difficulties inherent to marine impact assessment." The editors concluded that the study presented:

> *a realistic and sobering picture of the limitations of field monitoring in the marine environment. This study was well designed, well funded, and well implemented within the control of its managers. It was one of the most rigorously, if not the most rigorously conducted studies of the marine impacts of oil and gas discharges. All of these strengths notwithstanding, however, it does not inspire great confidence in our ability to document adverse environmental impacts.... (Steinhauer et al; from Avanti 1993, pp. 4-38, 4-41.)*

The EPA proposes to fill some of these analytical gaps with a variety of required studies. Some of these studies are discussed in greater detail below under *Essential Fish Habitat*. Another effort to fill this analytical gap is the proposed NPDES permit's requirement for dischargers to develop a feasibility assessment for the installation of on-line oil and gas monitors at the OCS platforms.

3.2.3 *Installation of continuous oil-in-water monitors*

The Clean Water Act provides for the regulation of the discharge of oil and any hazardous substances harmful to the public health or welfare of the United States.[19] Accordingly, EPA

[19] Clean Water Act §311(b)(4)

regulations identify as harmful to the public health or welfare or environment of the United States, any discharges of oil that: (a) violate applicable water quality standards, or (b) cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.[20] Thus, NPDES permits prohibit the discharge of free oil, and the proposed permit effectively prohibits the use of non-aqueous based drilling muds. "Free oil" refers to any oil contained in a waste stream that when discharged will cause a film or sheen upon or a discoloration of the surface of the receiving water or adjoining shorelines, or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines likelihood of oil contamination) before discharge by using the American Petroleum Institute (API) Retort Test *(API, 1985)* and static sheen test (EPA *Region 9, 1986; 58 Federal Register 12506)."* The presence of free oil in other discharges is determined on each day of discharge by a static sheen test of receiving waters.[21]

The Commission has previously expressed concerns that static sheen tests and visual observations are not good indicators of whether or not a discharge contains oil or grease in emulsion. In particular, the Commission notes that discharges occur below the ocean surface and that the effluent "plume" may not rise to the surface (if at all) until some distance from the platform, thereby inhibiting visual observation of a sheen. However, EPA Region 9 does not require static sheen tests for <u>all</u> discharges for the following reasons:

1. The proposed requirements "appropriately balance the need to ensure compliance with the prohibition on the discharge of free oil, and the costs associated with permit compliance. (Sheen test costs have been estimated at $25 per test *(53 Federal Register 41366)* and large numbers of tests for numerous discharges could result in significant compliance costs.)"

2. The proposed permit includes effluent limits and analytical testing requirements for oil and grease in produced water and well completion, treatment and workover fluids as obtained from the *1993 Effluent Guidelines.*

In 1984, the Commission recommended that the EPA develop and require use of a continuous, automatic oil-in-water monitoring system on offshore platforms to measure oil in receiving waters. *(Commission Final Adopted General Policy Statement on the Ocean Disposal of Drilling Muds and Cuttings, p. 7.)* In 1992, EPA Region 9 and Exxon reviewed technologies for continuous oil-in-water monitoring and found although different methods exist (such as methods

[20] 40 CFR Ch. 1, §110.3

[21] In the static sheen test, the permittee mixes effluent with ambient seawater in a test container and observes whether or not a sheen appears on the water surface in the container. The NPDES permit requires permittees to report if a sheen was observed each day that a discharge occurs. If a sheen is observed during the static sheen test, the effluent may not be discharged. If no sheen is present, the effluent is in compliance with the no "free oil" limitation and may be discharged. If a sheen is observed in receiving waters after discharge, the permittee must report a permit violation. EPA Region 9 believes that the static sheen test is an acceptable test because it is reliable, it is better than simply making a visual observation of receiving waters, and it can be conducted before discharge. *(Fact Sheet, NPDES Permit Nos. CA0110648, September 1993, pp. 9-1a)*

based on ultraviolet light absorption and solvent extraction), the equipment does not produce accurate reliable oil-in-water data. *(CC-85-92, April 1993.)* For example, the equipment can become fouled when used to measure oil and grease in produced water.

However, recent information suggests that the United States Navy has started using on-line oil and grease monitors at various facilities. The Commission believes that this technology warrants a new look as is required by the proposed NPDES permit. Should the feasibility study demonstrate that this technology has improved sufficiently, the Commission believes that future NPDES permits should incorporate requirements for the installation of these monitors in order to more accurately assess discharge levels.

3.2.4 *Essential Fish Habitat*

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act require that federal agencies consult with the National Marine Fisheries Service ("NMFS") on all actions undertaken by the agency which may adversely affect "essential fish habitat" ("EFH"). This consultation occurs outside of consultation to fulfill the terms of Section 7 of the Endangered Species Act.[22] Therefore, in accordance with the new Magnuson-Stevens Act requirements, EPA prepared an assessment of the effects of the discharges on EFH.
EFH includes "…those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Although oil platforms have not been designated as EFH by NMFS, the waters around them have. NMFS considers these areas to be ecologically important.

NMFS responded to EPA's Biological Assessment in a letter dated October 20, 2000 (Exhibit J). NMFS stressed the importance of EFH ecological function in terms of reproductive potential, rather than total surface area of all designated EFH. In other words, though the proportion of "hard bottom" habitat provided by platforms is insignificant relative to the entire EFH-designated California Bight, larger and thus more fecund rockfish absent from many local reefs are found at the platforms. However, as NMFS points out, "enhanced reproductive potential may be compromised by toxic conditions created within the mixing zone at oil platforms."[23]

NMFS also noted that "….Of the 82 fish species federally managed in the Pacific Groundfish Fishery Management Plan ("FMP"), 39 have been recorded in various water depths over a 35-year period at southern California platforms." NMFS also pointed out that all life stages of many

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[22] (16 USC §1536) The area covered by the proposed permit potentially includes species under the jurisdiction of both the U.S. Fish and Wildlife Service ("USFWS") and the National Marine Fisheries Service (``NMFS''). As such, EPA prepared separate Biological Assessments (BAs) for either agency. Both BAs concluded that there would be no effect on listed species. The Long Beach office of the NMFS and the Ventura Field Office of the USFWS have reviewed the proposed permit, and have commented on the EPA's conclusions concerning the effects of the proposed discharges on listed species. NMFS's comments are discussed in detail under Essential Fish Habitat.

[23] Rebecca Lent, Ph.D., Regional Administrator National Marine Fisheries Service, Southwest Region, October 20, 2000 letter to EPA.

of these species occur, including Bocaccio, a candidate for listing under the Endangered Species Act.

The NMFS evaluation of the EPA report on EFH concurred in most of the EPA's findings regarding produced water, and drilling muds and cuttings. However, NMFS did not concur with the EPA position that discharge effects would be insignificant within the 100-meter mixing zone. NMFS provided EPA with a series of recommendations, which EPA has modified and adopted, into the body of the proposed NPDES permit. The recommendations are intended to (a) evaluate the direct lethal, sublethal, and bioaccumulative effects of produced water on federally managed fish species; (b) model dilution and dispersion plumes from the point of production water discharge to determine the extent of the area in which federally managed fish species may be adversely affected, and; (c) propose mitigation measures warranted by the results of recommendations "a" or "b". In addition, EPA has committed to a permit re-opener provision, and possible further effluent limitations based on the findings of "a" or "b" above.

3.2.5 *Cumulative Effects*

Cumulative effect as defined in Coastal Act §30105.5 means "the incremental effects of an individual project shall be reviewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." For the proposed NPDES permit, this includes the actual and potential impacts of the project as a whole, as well as the impacts on the marine environment of other projects in the vicinity of the 22 platforms.

Notwithstanding this permit's improved discharge standards, the Commission remains greatly concerned over the cumulative impacts of waste discharges on the marine environment given the potential for bioaccumulation and sublethal but persistent toxic effects.

In 1987, the Department of the Interior indicated that between 2,700,000 and 5,400,000 bbls. of muds and cuttings would be generated over the next 20 years in the southern California planning area (offshore Santa Barbara County through San Diego County, although most of the discharges would occur in the Santa Barbara Channel). *(MMS, Status of Leases, Pacific OCS Region, August 1987.)* Under the proposed NPDES permit, the EPA proposes to allow the discharge of 2,189,000 barrels (bbl) of drilling fluids, 666,150 bbl of cuttings, and 62,500 bbl of excess cement for the next five years.

Proposed exploration wells now under review by Commission staff, as well as any future exploration wells with which Commission staff is unfamiliar may augment these projections.

The cumulative effects of discharging large volumes of drilling wastes to the Santa Barbara Channel was extensively reviewed in the ARCO Coal Point Environmental Impact Report ("EIR"). (ARCO *Coal Oil Point FEIRIS, 1987.)* Specifically, the EIR expressed greater concern over discharges from production projects than for exploratory projects and input from rivers, because exploratory projects are of short duration and the benthic environment is given time to recover from river inputs that primarily occur during infrequent storms. Production impacts, on the other hand, "might affect recruitment for an extended period of time and represent a constant

stress to benthic organisms in the area of impact. Chronic effects of long-term discharges is a subject that needs much more study before impacts on marine communities can be predicted.

Barite, a mineral used as a weighting agent in drilling operations, contains barium, which is generally considered to be the major toxic additive to drill muds. The EIR reviewed the cumulative addition of large quantities of barium to sediments in the Santa Barbara Channel, noting that drilling muds are the major sources of barium on a mass discharge basis, and analyzed the cumulative impact of drilling muds and cuttings discharges as follows:

> *Although particulate barite is non-toxic and thought to be biologically inert, areawide changes in sediment levels may have biological implications that we do not currently recognize or understand. Ocean discharge of drilling wastes is judged to constitute a Class H impact. Prohibiting ocean discharge of drilling wastes could mitigate impacts.*

The EIR also expressed concern over the impacts of produced water discharges on marine biology:

> *Sublethal effects on reproduction, larval settlement, competitive ability, disease resistance, etc. could lead to long-term changes in benthic community structure and function. Too little is known to project the possible ecological consequences of sublethal effects of cumulative produced water discharge in the Santa Barbara Channel, but, this analysis suggests it could be widespread and of regional significance. This issue … should be given high priority in future environmental impact analysis. Ocean discharge of produced water is judged to be a Class 11 impact. Impacts could be mitigated by prohibiting ocean discharge of produced water.*

Other concerns with the cumulative impacts of development and production discharges include: impacts on commercial fishing through seafloor burial by muds and cuttings; potential influences on larval settlement and recruitment to benthic communities; effects on organisms' ecological interactions and resistance to disease; and food chain concentration of toxic chemicals through bioaccumulation (resulting in high tissue burdens of toxic chemicals in top predators). The threat of bioaccumulation to marine biota from cumulative input, however, is difficult to determine at present and warrants further study.

The proposed permit does offer one substantial improvement in this area in that it effectively prohibits the use of non-aqueous based drilling muds. In so doing, the proposed permit would diminish contaminant levels present in drilling fluids.

With the exception of the aforementioned analyses of produced waters, the subject of cumulative effects of produced water is insufficiently understood at this time. Therefore, the Commission supports the EPA's inclusion of NMFS-requested evaluations to determine the plume characteristics and long-term effects of produced water discharges at OCS platforms.

3.2.6 *Monitoring*

One of the most challenging issues in developing the new NPDES permit has been the resolution of how to monitor compliance with discharge standards most effectively. Section 308(a)(4)(A) of the Clean Water Act ("CWA") requires a discharger to conduct monitoring to determine compliance with effluent limitations and other permit conditions. Accordingly, the general NPDES permit requires dischargers to conduct daily monitoring of effluent, quarterly chronic toxicity tests with red abalone, and annual toxicity screening (giant kelp, topsmelt, and red abalone). Dischargers must report effluent monitoring results on a monthly basis, and toxicity monitoring results within the month the testing occurs. Any incidents of discharge violations must be reported within 24-hours of the violation.

The EPA asserts that the legal basis for the NPDES compliance program strictly allows for a combination of self-monitoring, spot checks by agency personnel, and the levying of fines in cases of violations. Based upon its review of operators' past performance, the EPA maintains that operators are adequately sampling and reporting data, and that no additional oversight monitoring is necessary.

However, many parties, including the Coastal Commission, the County of Santa Barbara, and Channelkeeper have expressed concern about reliance upon the veracity of self-collected, self-tested, and self-reported data. This concern is substantiated by a 1980s whistleblower incident at Platform Grace in which reported data was falsified, and an $8 million dollar fine was levied.

Partly in response to this incident, and to allay concerns about the need for additional compliance monitoring, the EPA and the Minerals Management Service ("MMS") entered into a Memorandum of Agreement ("MOA") in November, 1989 (Exhibit C). This MOA was designed to improve coordination in NPDES permit compliance monitoring. The MOA provides for the EPA and the MMS to develop annual compliance monitoring work-plans containing specific inspection and sampling protocol for the year.

In addition to the annual compliance monitoring work-plans, the Coastal Commission brokered compliance monitoring side agreements as part of four individual NPDES permit proceedings. In these side agreements, the MMS and the dischargers agreed to quarterly monitoring of discharges at permitted platforms. The EPA was not a party to these side agreements, and provided neither funding, nor manpower to implement the agreement provisions. These agreements consisted of (a) specification that MMS inspectors would conduct a minimum of four annual random (unannounced) sampling inspections in addition to two joint EPA-MMS annual sampling inspections, (b) letters from the operators stating their willingness to comply with the modified inspection programs, and, in some cases, (c) commitments from the operators to pay for laboratory analysis of the samples.

Although the workplans developed and executed by the EPA and the MMS under the 1989 MOU were successfully executed, monitoring records indicate that the individual side agreements were less successful. Specifically, the anticipated levels of compliance monitoring did not, in fact, take place in part due to MMS staffing limitations. Actual sampling and inspection visits are outlined in Exhibit K. These side agreements would be superceded upon the issuance of a new general

NPDES permit, and both of these shortcomings are addressed under the terms of the currently proposed monitoring program.

Coastal Commission Concerns with Monitoring Provisions

The original draft general NPDES permit issued in July 2000 by the EPA for public comment (and submitted with the EPA's consistency certification) provided for self-monitoring (as described above) and occasional unannounced spot checks by EPA, or MMS personnel. No side agreements were envisioned as part of the new permit.

The Commission staff communicated to the EPA its concern that the draft general NPDES permit did not contain produced water-monitoring requirements adequate to find the permit consistent with California's Coastal Management Program. The Commission staff requested that, to reduce the potential for NPDES violations and adverse coastal zone impacts, the EPA provide additional discharge monitoring commitments either as permit requirements or through modified inter-agency agreements.

As described in Section 2.1.1 of this report, the EPA, in response to Commission staff concerns, amended its consistency certification to include additional joint EPA and MMS agency compliance monitoring during the five-year term of this general NPDES permit.

The proposed monitoring program will contribute substantially to improved water quality in and around the OCS platforms. First, the proposed program will broaden testing to include both chemical analysis and chronic toxicity assessment. In so doing, concerned parties will be better prepared to assess the biological effects of discharges on the OCS. Second, the proposed program will expand agency oversight of discharges, including unannounced spot-checks of platforms. Last, as part of the annual workplans, the proposed monitoring program would set a specific and guaranteed level of monitoring and oversight to ensure compliance with discharge limits (Exhibit C). In the event that toxicity effects are identified, the EPA is prepared to reopen the permit in order to revisit discharge limits. In the event that compliance problems arise, the EPA has an established protocol for rectifying the situation, including the assessment of fines. Altogether, the proposed monitoring and enforcement program will ensure greater protection of coastal resources than currently exists.

3.2.7 *Conclusion*

For the reasons state above, the Commission finds the project inconsistent with Coastal Act § 30230, 30231 and 30250 since, even with the EPA's proposed mitigation measures and additional compliance monitoring, present and future discharges will continue to result in significant adverse individual and cumulative marine resource, water quality and fishery impacts. Nevertheless, the proposed permit can be found consistent with the Coastal Act under the coastal-dependent industrial "override" provision (§30260) of the Coastal Act for the reasons discussed below in Section 3.3 of this report.

3.3 Coastal-Dependent Industrial "Override" Provision

Coastal Act §30101 defines a coastal-dependent development or use as that which "requires a site on or adjacent to the sea to be able to function at all." Ports, commercial fishing facilities, and offshore oil and gas platforms are coastal-dependent development types that the Coastal Act gives priority over types of development on or near the shoreline. Coastal Act §30001.2 finds that notwithstanding the environmental effects of offshore petroleum and gas development, the location of such developments in the coastal zone may be necessary. Consequently, Coastal Act §30260 provides for special consideration of coastal-dependent industrial facilities that may otherwise be found inconsistent with the Coastal Act's Chapter 3 policies. The proposed NPDES permit will authorize discharges of oil and gas exploration, development and production wastes from existing OCS platforms. OCS oil and gas platforms are clearly "coastal-dependent industrial facilities."

Coastal-dependent industrial facilities must be evaluated under all applicable policies and standards contained in Chapter 3. If the proposed project is inconsistent with any Chapter 3 policy, Section 30260 provides for approval of the coastal-dependent industrial development, nothwithstanding such inconsistencies of the development. Coastal Act §30260 specifically states:

> *Coastal-dependent industrial facilities shall be encouraged to locate or expand within existing sites and shall be permitted reasonable long-term growth where consistent with this division. However, where new or expanded coastal-dependent industrial facilities cannot feasibly be accommodated consistent other policies of this division, they may nonetheless be permitted in accordance with this section and Sections 30261 and 30262 if (1) alternative locations are infeasible or more environmentally damaging; (2) to do otherwise would adversely affect the public welfare; and (3) adverse environmental effects are mitigated to the maximum extent feasible.*

As described in Section 3.2 of this report, the proposed permit does not meet the standards of Coastal Act §30230, 30231, and 30250 due to the potential for significant adverse individual and cumulative marine resource, water quality and fishery impacts caused by platform discharges. Since the project qualifies as a "coastal-dependent industrial facility" the Commission may nevertheless approve the project if the three requirements of §30260 can be met.

3.3.1 *Alternative Locations*

The Commission may approve proposed discharges notwithstanding the project's inconsistency with one or more policies of Chapter 3 of the Coastal Act if it finds that alternative discharge locations are infeasible or more environmentally damaging.

Since the 22 platforms that are subject of the proposed NPDES permit already exist, the only feasible alternatives to discharging wastes are (1) barging of all muds and cuttings to an onshore disposal site, and (2) reinjection of wastes – particularly produced water - into deep wells. In Section 3.1 of this report, the Commission found that barging-to-shore and rejection of muds and cuttings is either infeasible or more environmentally damaging. The Commission must further

find that there is no feasible less environmentally damaging alternative to the proposed discharge into ocean waters of produced water.

Produced water is sometimes reinjected into non-producing wells, either onsite at the platform, at another platform, or even onshore. Like drilling muds and cuttings, the reinjection of produced water is limited by geology, and the availability of non-producing wells.[24] Sandstone formations are more receptive to reinjection than the Monterey shale formations which characterize the area around the 22 platforms on the OCS.

The lower particulate content of produced water relative to drilling muds or cuttings would enhance reinjection potential somewhat, although the volume of the produced water would be substantially greater than that of drilling muds and cuttings. Moreover, in order for reinjection of produced water to succeed, bacterial growth capable of clogging formations must be limited. Therefore, produced water is sometimes treated with biocides prior to reinjection. This addition of another toxic component may in some cases render this option less preferable than direct discharge.

Given these limitations, and the information available at this time, the Commission finds that reinjecting produced water at all platforms is not currently feasible. However, the Commission expects the EPA to consider the feasibility of partial and complete reinjection of produced water in any future consistency review of the general NPDES permit.

The Commission thus finds that the discharge into the surrounding marine environment represents both the only feasible and the environmentally preferable location for disposal of the subject waste fluid and materiels at this time.

3.3.2 *Public Welfare*

The second test of §30260 states that coastal-dependent industrial development may be permitted if to do otherwise would adversely affect the public welfare. This test requires that the Commission find that the public welfare would be adversely affected were the Commission to object to the EPA's consistency certification and thus preclude issuance of the general NPDES permit. The Commission has also interpreted this provision to raise the questions of (1) whether any adverse effect to the public that would result from the Commission's objection is outweighed by the proposal's effects on the coastal environment, and (2) whether environmental effects may feasibly be mitigated while preserving any national interest benefits of a project.

The proposal's adverse effects on the marine environment, and thus to the public trust, are described in detail above. The Commission has reached the conclusion that the proposal will result in adverse effects to the coastal environment. However, the Commission has determined

[24] Produced water could, in theory, be reinjected into producing wells, although the advance design and construction necessary to accomplish such reinjection renders this technology infeasible for the existing platforms.

that approval of the certification will result in benefits to public welfare that outweigh the adverse effects of the proposal. In fact, the Commission concludes that denial of the certification would adversely affect the public welfare.

First, the Commission acknowledges the proposed certification's contribution to the national interest, insofar as it provides continuing energy benefits from existing oil and gas development and production operations.

Second, the promulgation of a new and more stringent NPDES permits resulting in substantial improvements to water quality in and around OCS platforms is clearly in the public interest. The permit conditions and compliance provisions provide assurance that the proposed certification will protect the marine environment with current and stringent effluent standards.

In contrast, the failure to issue this permit will further delay more stringent OCS platform discharge standards, protective measures delayed in some cases nearly twenty years. The delay of the NPDES process ensures the status quo of weak, inadequate, and antiquated discharge standards for the 22 OCS platforms.

The Commission concludes that the potential benefits offered by the proposed NPDES permit far outweigh the NPDES permit's adverse impacts and that, therefore, the non-renewal of the NPDES permit would adversely affect the public welfare.

3.3.3 *Maximum Feasible Mitigation*

The third and final test in §30260 requires a finding that the adverse environmental impacts of a project have been mitigated to the maximum extent feasible.

The EPA has adopted measures within the body of the permit to mitigate the potential adverse impacts of discharging waste into marine waters. The mitigation falls into two key categories: (a) the establishment of more stringent effluent limits, and (b) the establishment of discharge limits on drilling muds and cuttings. In addition, the EPA is requiring implementation of a comprehensive compliance monitoring program, and the requirement of various analyses designed to either offset adverse effects of the discharge, or assess the feasibility of avoiding discharges entirely. Therefore, the question before the Commission is whether the EPA has applied the maximum feasible mitigation measures to offset the adverse environmental effects of the proposed permit.

The effluent limits established by the EPA are based either upon the EPA's most recent 1993 effluent limits discussed above, or they have drawn from National Ocean and Atmospheric Administration ("NOAA") advised effluent limits[25], which are equally protective of water quality. In either case, these limits represent the most stringent, scientifically defensible effluent limits available. Therefore, short of prohibiting discharge, or requiring reinjection, both of which are considered infeasible, the EPA has applied the maximum feasible mitigation measures.

[25] National Oceanic and Atmospheric Administration, Screening Quick Reference Table for Inorganics in Water (SquiRTs).

As discussed in section 3.2 of this report, the first-time limit on the discharge of drilling muds and cuttings also represents the maximum feasible mitigation measure for the discharge of drilling muds and cuttings to the marine environment. This is because barging represents potentially more adverse environmental effects, and reinjection is considered infeasible. Nevertheless, the EPA is requiring as part of the permit that dischargers provide, prior to one year before the expiration of the permit, an examination of alternative disposal options that resource managers may consider in crafting future NPDES permits.

With regards to monitoring and enforcement, the EPA and the MMS will establish a new and expanded compliance-monitoring program designed to provide an appropriate level of oversight. However, this program may not satisfy all parties, many of whom prefer the presence of independent, third party compliance monitors. Therefore, the Commission must ask itself whether the proposal reflects the maximum feasible level of mitigation. Commission staff concurs with the EPA's assertion that the Clean Water Act does not require, or even authorize the establishment of such monitoring parties as part of the NPDES permit process. The very basis of the NPDES permit monitoring program is one of self-monitoring and reporting, with occasional compliance monitoring by agency officials.

However, the NPDES permit process does not preclude the establishment of broader and more thorough compliance monitoring programs. The compliance monitoring program envisioned as part and parcel of the general NPDES permit now before the Commission includes a critical provision for agency oversight in which the EPA and the MMS will continue to collaborate in their oversight role, but in an expanded and improved fashion. The proposed monitoring and compliance program also provides several "insurance policies" for program funding in the event that the EPA is unable to meet its commitments for compliance monitoring under the general permit. Therefore, the proposed compliance-monitoring program represents the maximum feasible mitigation measure.

It is also worth noting that the focus of the program will be on toxicity, and not be limited to discharge limits. This biological emphasis will provide agencies like the Coastal Commission, NOAA, and others with a more comprehensive understanding of the chronic effects of the discharge on the marine biological environment. The addition of random and unannounced spot checks for toxicity evaluations and discharge limits will ensure compliance with the terms of the new permit.

Beyond the maximum feasible mitigation measures the EPA is proposing a number of measures that will enhance the mitigation measures. In anticipation of potentially more stringent requirements in the future, the permit will also require a series of analyses in such areas as the feasibility of disposal methods for drilling fluids and cuttings other than direct discharge (*e.g.*, recycling, reinjection, barging to shore, ocean disposal), and an assessment of the emission levels of vessels used in transporting drilling fluids for disposal. In addition, the permit requires a feasibility assessment for the installation of on-line oil and grease monitors, and an evaluation of the chronic toxicity effect on essential fish habitat.

Daily effluent monitoring and quarterly toxicity testing by the applicant will provide the EPA with a thorough data set with which to evaluate discharges at OCS platforms. Twice per year per platform unannounced and random sampling for toxicity by the EPA and MMS will ensure compliance with the terms of the permit. Agreements with industry and the Regional Water

Quality Control Board to fund monitoring if and when the EPA is unable to fulfill its commitments provide an additional degree of confidence that the terms of the permit will be met.

The proposed monitoring program will contribute substantially to improved water quality in and around the OCS platforms. First, the proposed program will broaden testing to include both chemical analysis and chronic toxicity assessment. In so doing, concerned parties will be better prepared to assess the biological effects of discharges on the OCS. Second, the proposed program will expand agency oversight of discharges, including unannounced spot-checks of platforms. Last, the proposed monitoring program would set a specific and guaranteed level of monitoring and oversight to ensure compliance with discharge limits. In the event that toxicity effects are identified, the EPA is prepared to reopen the permit in order to revisit discharge limits. In the event that compliance problems arise, the EPA has an established protocol for rectifying the situation, including the assessment of fines. Altogether, the proposed monitoring and enforcement program will ensure greater protection of coastal resources than currently exists.

Therefore, based upon the requirements and commitments described above, the Commission finds that the adverse environmental impacts of the project have been mitigated to the maximum extent feasible and thus the third and final test of Coastal Act §30260 has been satisifed.

3.3.4 *Coastal Act §30260 Conclusion*

Applying the above considerations and limitations, the Commission finds that the proposed discharge activities are consistent with Coastal Act §30260.

APPENDIX A

SUBSTANTIVE FILE DOCUMENTS

1. Notice of Availability of Proposed National Pollutant Discharge Elimination System ("NPDES") General Permit for Offshore Oil and Gas Exploration, Development and Production Operations off Southern California; Notice, Federal Register, July 20, 2000 (Volume 65, Number 140), pp. 45063-45066.

2. Fact Sheet for Proposed National Pollutant Discharge Elimination System ("NPDES") General Permit for Offshore Oil and Gas Exploration, Development and Production Operations off Southern California. 44 p.

3. Consistency Certification Nos. CC-85-92, CC-68-92, CC-68-93, CC-45-94, and CC-65-94, (EPA – CCC concurred in EPA's consistency certification for five individual platforms).

4. Consistency Certification No. CC-26-83 (Environmental Protection Agency - CCC concurrence in the EPA's consistency certification that reissuance of the General NPDES Permit through 6/84 was consistent with the CCMP [EPA originally issued the General Permit in 2/82 with an expiration date of 1/84]).

5. Consistency Certification No. CC-38-85, CC-39-85 (EPA – In 2/86, CCC objected to EPA consistency certifications for two new proposed NPDES General Permits. [The existing NPDES General Permit has been extended administratively by the EPA since 1984]).

6. National Marine Fisheries Service Recommendations to EPA regarding Essential Fish Habitat protection in the issuance of a new General Permit. October 20, 2000. 4 pp.

7. Mineral Management Service Comments on the draft General NPDES permit. September 13, 2000. 4 pp.

8. Environmental Defense Center Comments on the draft General NPDES permit. September 5, 2000. 6 pp.

9. County of Santa Barbara, Planning and Development, Energy Division, Comments on Draft General NPDES Permit for Pacific OCS Oil and Gas Operations. September 5, 2000. 3 pp.

10. Produced Water: Technological/Environmental Issues and Solutions, James P. Ray ed. Plenum Press, New York. 1992.

11. Biological Assessment For Endangered Species in Outer Continental Shelf Waters of South and Central California for Consultation with the United States Fish and Wildlife Service. Prepared by Science Applications International Corporation for the EPA. February 10, 2000.

12. Biological Assessment for Endangered Species in Outer Continental Shelf Waters of South and Central California For Consultation With The National Marine Fisheries Service. Prepared by Science Applications International Corporation for the EPA. February 10, 2000.

13. Ocean Discharge Criteria Evaluation South and Central California for NPDES Permit No. CAG280000. Prepared by Science Applications International Corporation for the EPA. January 3, 2000.

14. NOAA Screening Quick Reference Table for Inorganics in Water (SQRTs) HAZMAT Report 99-1. September, 1999. 4 pp.

15. Helvey, Mark, "Are Southern California Oil and Gas Platforms Essential Fish Habitat?" (Draft) 11 pp.

16. Long, Edward R. et al. Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management Vol. 19, No. 1, pp. 81-97. 1995.

17. Higashi, R.M. et al. An Approach to Toxicant Isolation From a Produced Water Source in the Santa Barbara Channel. Produced Water, J.P. Ray, ed. pp. 223-233. 1992.

18. Osenberg, C.W. et al. Spatial Scale of Ecological Effects Associated with an Open Coast Discharge of Produced Water. Produced Water, J.P. Ray ed. pp. 387-402. 1992.

19. Krause, P.R. Effects of Produced Water on Early Life Stages of a Sea Urchin: Stage-Specific Responses and Delayed Expression. Produced Water, J.P. Ray ed. pp. 431-444. 1992.

20. Raimondi, P.T. and R.J. Schmitt. Effects of Produced Water on Settlement of Larvae: Field Tests Using Red Abalone. Produced Water, J.P. Ray ed. pp. 415-430. 1992.

21. Neff, J.M., et al. Composition, Fate, and Effects of Produced Water Discharges to Nearshore Marine Waters. Produced Water, J.P. Ray ed. pp. 371-387. 1992.